RESPONSE TO THE USE OF TREND CURVES BY ERWIN, FRANK AND CURTIS, AND O'BRIEN AND WIBMER

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Abstract

The use of the trend curve technique by Erwin, Frank and Curtis, and O'Brien and Wibmer offers examples of how trend curves should not be used. Trend curves should be used to provide an estimate of final species totals when descriptive work is well advanced and continuing.

It is quite gratifying to note the recent use of trend curves, a technique pioneered by Steyskal (1965) to predict final species total for a taxon or to indicate if considerable descriptive work remains. My paper on trend curves (White 1975) for various groups of Coleoptera is the basis for much of the use of trend curves for beetles. The trend curve technique was referred to, but not actually used, by Erwin (1978), and it is the subject of papers by Frank and Curtis (1979) and O'Brien and Wibmer (1979). Unfortunately, these contributions reflect some important misconceptions about the trend curve technique, and I will attempt to explain the conditions under which trend curves can be used, and the conditions under which they should not be used.

In Erwin's paper, Fig. 1 on page 262 is labelled "Trend curve for species of *Agra*." However, this is not a trend curve, but is a simple graph. In constructing a trend curve, points representing cumulative species totals are placed on a graph, then, in effect, the points are *averaged* by drawing a smooth curve. If a trend curve were constructed from the *Agra* data, it would still be on the ascension and would bear no predictive value. That is, the final species total (given by Erwin as about 2000) could not be estimated. Neither the mid-point nor end-point of a trend curve can be fixed *unless* that trend curve is clearly on its way to becoming sigmoidal. Erwin's comments (p. 262), therefore, do not bear on trend curves.

I find a tendency by both Frank & Curtis and O'Brien & Wibmer to interpret my findings in an excessively rigid manner, especially with respect to my estimates of approximate end-points in years for species description in the various groups. In my article I referred to what could be expected after the end-points as follows (p. 294): ". . . with *relatively* few additional species described thereafter" (italics here for emphasis). In this comment, and in greater detail at the top of page 295, I attempted to make clear that my use of the phrase "end-point of species description" was not intended to mean that no species would be described after the dates given. Obviously, because of the possibility of lagging progress and other factors to which I referred, no such prediction of the absolute end of species description can be made.

Of the 7 trend curves that appear in the O'Brien and Wibmer paper, the one for the Palaearctic Region seems closest to being a reliable curve, for it is based on a fauna which is clearly well known. I see no point in constructing a trend curve for the Nearctic Curculionidae because, as I ex-

plained in my original paper, there is a likelihood of much undetected synonymy among Casey species, and the same applies to the Frank and Curtis treatment of Staphylinidae. The curve for Neotropical Curculionidae is clearly still on the ascension, so the attempt to assign a mid-point and estimate final species totals has no basis. Lack of current taxonomic progress in Australian weevils makes the attempt to construct a curve useless, for there is no point in making a curve in defiance of what is known about a fauna. Finally, the unknown extent of the Neotropical and Australian weevil faunas offers no basis for constructing a curve for the world Curculionidae!

I applied the trend curve technique for prediction of final species totals to selected groups of North American beetles because it is clear that most extant species of this fauna have been described. As part of my duties I identify thousands of specimens of North American Chrysomelidae and Anobiidae, and I very infrequently encounter a beetle that I suspect is undescribed. The experiences of many other beetle taxonomists are comparable.

I am grateful for the attempts by Erwin, Frank and Curtis, and O'Brien and Wibmer to make use of trend curves, for these attempts offer examples of how they should *not* be used. These papers offer abundant meaningful commentary on the ease of incorrect technique, but little upon the correct use of trend curves.

When a trend curve is properly used, it will offer a prediction of the total number of species in a taxon after species descriptive work is completed, provided that species description is now well advanced and continuing. A curve can also be used to indicate the extent of knowledge of a group, for, clearly, if a curve is still on the ascension much descriptive work remains. For a curve to bear predictive value its upper end must clearly have slowed in rate of ascension and started arching over, for only then can a mid-point be plotted. The estimate of final species total provided by a trend curve is more precise than is a subjective opinion. If we assume that the descriptive work will continue at an even rate, a trend curve can be used to provide a rough estimate of the time when this work might be completed.

References

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